



NASA STTR 2004 Phase I Solicitation

T1.02 Space Radiation Dosimetry and Countermeasures

Lead Center: ARC

As NASA embarks on a new Exploration agenda, the study of the space radiation environment and its effects on living things and support technologies will be critical for the success of long-term missions. Our current understanding of the space radiation environment, particularly high atomic number and energy particles (HZE particles) and energetic protons, and its interaction with materials, technological systems, and living things is limited compared to our understanding of gamma and x-rays. NASA has established a space radiation laboratory at Brookhaven National Labs capable of generating HZE particles and protons, and supports a facility at Loma Linda University Medical Center capable of generating energetic protons to enable research studies. We seek innovative technology solutions in the following areas:

Advanced Dosimetry Systems

- Real time dosimetry providing dose and particle types and energies for use onboard spacecraft and planetary habitats
- Real-time and cumulative dosimeters for characterizing space environments, including planetary surfaces
- Alarm systems for Solar Particle Events
- Microdosimetry for research applications including implantable dosimeters for biological studies

Radiation Hardened Electronic Systems

- Methods for hardening pre-existing technologies
- Novel materials and circuit design

Shielding Materials and Systems

- Multi-use materials for spacecraft and habitat fabrication (high strength, high shielding characteristics,

embedded dosimetry, or warning devices)

- Materials for advanced EVA suits
- Alternative non-materials based shielding technologies

Life Support Systems Composition and Monitoring

- Technologies to monitor the composition and health of biological components (microbial and plant) of life support and bio-remediation systems
- Development of radiation resistant organisms for life support and bio-remediation systems

Biological Markers of Human Radiation Exposure

- Identify markers of radiation damage that can be obtained in a minimally invasive manner
- Technological systems to identify and quantitate biological markers onboard spacecraft and planetary habitats

Astronaut Health Countermeasures

- Pharmaceuticals to counteract the deleterious effects of space radiation exposure
- Gene therapy and other biological approaches
- Markers for genetic susceptibility to space radiation damage